

Serial No. 10/725,021

Docket No. DPO-0008

Amtd. dated December 13, 2006

Reply to Office Action of September 14, 2006

Amendments to the Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1. (Previously Presented) A method of charging a plurality of batteries comprising:
controlling charging each of a plurality of batteries, wherein the each of the plurality of batteries is charged alternatively and wherein the alternative charging is based on satisfying at least one of a charging voltage of each of the plurality of batteries being greater than a reference voltage and a charging current of each of the plurality of batteries being less than a limit current;
charging a first battery with a constant current until a voltage of said first battery becomes greater than a reference voltage;
charging a second battery with said constant current until a voltage of said second battery becomes greater than said reference voltage;
resuming charging of said first battery until the charging current is less than a limit current indicating a state of full charge; and
resuming charging of said second battery until the charging current is less than said limit current indicating said state of full charge.

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2. (Original) The method of claim 1, wherein said reference voltage is between approximately 70% and approximately 80% of a full charging voltage.

3. (Original) The method of claim 1, wherein said reference current is a current value at a time of approximately 80% of a full charging voltage.

4. (Original) The method of claim 1, wherein said limit current is a current value at a time of approximately 95% of a full charging voltage.

5.-7. (Canceled)

8. (Previously Presented) The method of claim 1, wherein the alternative charging comprises :

charging a first battery with a constant current until a charging voltage becomes a first reference voltage;

charging a second battery with a constant current until a charging voltage becomes a second reference voltage;

charging a third battery with a constant current until a charging voltage becomes a third reference voltage; and

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charging a fourth battery with a constant current until a charging voltage becomes a fourth reference voltage.

9. (Previously Presented) The method of claim 8, further comprising:
resuming charging of the second battery until a charging current of the third battery is less than a reference current.

10. (Previously Presented) The method of claim 8, further comprising:
resuming charging of the second battery until the charging current of the third battery is less than a limit current indicating a state of full charge.

11.-13. (Canceled)

14. (Currently Amended) A method of charging a plurality of batteries comprising:

identifying a charging voltage/current characteristic of at least one of the plurality of batteries;

controlling charging of each of the plurality of batteries according to a charging voltage/current characteristic of each of the plurality of batteries, wherein the each of the plurality of batteries is charged alternatively;

charging a first battery of said plurality of batteries based on a first charging voltage/current characteristic of said first battery;

charging a second battery of said plurality of batteries based on a first charging voltage/current characteristic of said second battery;

stopping charging of one of the first battery and the second battery based on a second charging voltage/current characteristic of one of said first battery and said second battery; and

completing charging of one of the first battery ~~or~~ and the second battery based on the charging voltage/current characteristic of said one of the first battery or and the second battery, the charging voltage/current characteristic being related to a reference current indicating a state of full charge, the completing charging comprising resuming charging of one of said first battery and said second battery until the charging current is less than the reference current,

wherein said charging voltage/current characteristic has one of a voltage gradient and a current gradient according to a charging voltage/current of each of the plurality of batteries.

15. (Canceled)

16. (Previously Presented) The method claim 14, wherein when said voltage of said first battery gradually rises, said current goes to a constant current and then said current gradient goes to substantially zero, thereby said voltage of said first battery having a predetermined gradient, and wherein when said first battery is charged by some degree of charging, said current drops, said current gradient has a negative value, and then said first battery has a constant voltage zone, thereby said voltage of said voltage gradient being substantially zero.

17. (Previously Presented) The method of claim 14, wherein in said first charging voltage/current characteristic, said voltage gradient is more than zero and a charging voltage has a reference of approximately 4.0V, and wherein a charging current has references of approximately 100mA and approximately 200mA.

18. (Previously Presented) The method of claim 14, wherein in said second charging voltage/current characteristic, said voltage gradient is more than zero and a charging voltage has a reference of approximately 4.2V, and wherein a charging current has references of approximately 100mA and approximately 200mA.

19. (Previously Presented) The method of claim 14, wherein in said first battery charging, said voltage gradient of said first battery is not more than zero, and a charging voltage of said first battery is not more than approximately 4.0V, and wherein if said voltage gradient is not more than zero and said charging current is more than approximately 100mA and not less than approximately 200mA, then said first battery is charged and said second battery is not charged.

20. (Previously Presented) The method of claim 14, wherein in said second battery charging, said voltage gradient of said second battery is more than zero, and a charging voltage of said second battery is not more than approximately 4.0V; and wherein if said voltage gradient is not more than zero and said charging current is more than approximately 100mA and not less than approximately 200mA, then said second battery is charged and said first battery is not charged.

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21. (Previously Presented) The method of claim 14, wherein in said first battery charging, said voltage gradient of said first battery is more than zero, and a charging voltage of said first battery is less than approximately 4.2V, and wherein if said voltage gradient is not more than zero and said charging current is not less than approximately 200mA, then said first battery is charged and said second battery is not charged.

22. (Previously Presented) The method of claim 14, wherein in said second battery charging, said voltage gradient of said second battery is more than zero, and a charging voltage of said second battery is not less than 4.2V, and wherein if said voltage gradient is not more than zero and said charging current is not less than 200mA, then said second battery is charged and said first battery is not charged.

23. (Previously Presented) The method of claim 14, wherein in said charging completion, if said voltage gradient of said first or second battery is not more than zero, and a charging current is less than 200mA and not more than 100mA, then charging operation is completed.

24. (Previously Presented) The method of claim 14, wherein in said first battery charging, a voltage and a current are an initial rising voltage and an initial constant current applied to said first battery, respectively.

25. (Currently Amended) An apparatus to charge a plurality of batteries comprising:
a first circuit to apply at least one of constant voltage or constant current to a first battery;

a second circuit to apply at least one of constant voltage or constant current to a second battery; and

a control circuit to control operations of the first circuit and the second circuit such that the first battery and the second battery are alternately charged or stop charging according to charging voltage/current characteristics of the first battery and the second ~~battery~~battery, or resume charging according to charging voltage/current characteristics of the first battery and the second battery,

wherein the alternative charging is based on satisfying said charging voltage/current characteristics related to a reference voltage and a charging current being less than a reference current, and

wherein the charging comprises charging the first battery with a constant current until a voltage of the first battery becomes greater than the reference voltage and charging the

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second battery with the constant current until a voltage of the second battery becomes greater than the reference voltage, and

wherein the control circuit controls resuming charging of said first battery until the charging current is less than the reference current and controls resuming charging of said second battery until the charging current is less than the reference current.

26. (Canceled)

27. (Currently Amended) The apparatus of ~~claim 26~~claim 25, wherein said reference voltage is between approximately 70% and approximately 80% of a full charging voltage.

28. (Canceled)

29. (Currently Amended) The apparatus of ~~claim 28~~claim 25, wherein said reference current is a current value at a time of approximately 80% of a full charging voltage.

30. – 31. (Canceled)

32. (Previously Presented) The method of claim 1, further comprising:

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controlling charging the each of the plurality of batteries, wherein the each of the plurality of batteries is charged alternatively and wherein the alternative charging is based on satisfying said charging current being less than a reference current:

resuming charging of said first battery until the charging current is less than the reference current; and

resuming charging of said second battery until the charging current is less than the reference current.